

R E M A R K S

Applicants herewith submit Claims 1 to 10 as set forth in Appendix II of this paper. Claim 11 has been canceled, and Claim 7 has been amended, as indicated in the Listing of Claims set forth in Appendix I of this paper.

Accordingly, applicants have amended Claim 7 to to read on the subject matter of Claim 11 and, accordingly, Claim 11 has been canceled. No new matter has been added.

Applicants amendment was necessitated by the Examiner's rejection of Claim 7 under Section 112, ¶1, for lack of enablement concerning the referenced "catalyst". Since the issue was raised by the Examiner for the first time in the final action, applicants could not have made the amendment at an earlier stage of the proceedings. It is also respectfully noted that the Examiner could, and should, have raised the respective rejection in the first Office action. Accordingly, in light of this newly raised issue the finality of the office action would appear to be clearly premature. Applicants therefore respectfully submit that entry and full consideration of the amendment is equitable at this stage of proceedings. Favorable action is solicited.

The Examiner has rejected Claims 1 to 11 under Section 103(a) as being unpatentable in light of the teaching of *Braune* (US 5,854,377). In this context the Examiner points to the fact that *Braune* discloses that stage (a) of the respective process<sup>1)</sup>

*is carried out in at least two, preferably at least three, temperature zones. The temperature of a subsequent zone should be 1°-40°C, preferably 2°-30°C, in particular 5°-10°C, higher than the temperature of the preceding zone*

which allows for a mere difference of 1°C between two temperature zones. The Examiner takes the position that<sup>2)</sup>

*there is little difference as to conducting the actual reaction process regardless of the slight reaction temperature variations. Therefore, there is no patentable weight with this limitation over the prior art in the absence of unexpected results.*

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1) Col. 1, indicated lines 63 to 67, of US 5,854,377.

2) Page 8, line 19, to page 9, line 1, of the Office action.

In determining the differences between the prior art and the claims, the question under 35 U.S.C. 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious<sup>3</sup>). The Examiner's position that applicants' requirement that the temperature does not increase along the reactor cascade in stage (a) carries no weight in the determination under Section 103(a) is therefore deemed to be in error. Moreover, as explained by the Court in In re Antonie the "invention as a whole" which is referenced in 35 U.S.C. 103(a) encompasses the properties which are inherent in the claimed subject matter<sup>4</sup>):

*In determining whether the invention as a whole would have been obvious under 35 U.S.C. 103, we must first delineate the invention as a whole. In delineating the invention as a whole, we look not only to the subject matter which is literally recited in the claim in question... but also to those properties of the subject matter which are inherent in the subject matter and are disclosed in the specification... Just as we look to a chemical and its properties when we examine the obviousness of a composition of matter claim, it is this invention as a whole, and not some part of it, which must be obvious under 35 U.S.C. 103.*

The Examiner's position that the unexpected impact on the amount of unwanted by-products which results when the reaction temperature in stage (a) is modified as required in accordance with applicants' claims is irrelevant because<sup>5</sup>)

*the claims are unrelated to reducing the amount of unwanted by-product.*

is, therefore, equally deemed to be in error. The reduced formation of unwanted by-products is a direct result of the particular combination of requirements which characterizes applicants' process as defined in the claims, ie. the distinct advantage is inherent in the subject matter of applicants' claims. By disregarding the inherent properties of applicants' process which are addressed in the application, the Examiner clearly fails to consider applicants invention as a whole as required in a proper determination under Section 103.

Assuming, arguendo, a person of ordinary skill in the art would have taken the teaching of **Braune** that the temperature should be

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3) Stratoflex, Inc. v. Aeroquip Corp., 713 F.2d 1530, 218 USPQ 871 (CAFC 1983); Schenck v. Nortron Corp., 713 F.2d 782, 218 USPQ 698 (CAFC 1983)

4) In re Antonie, 559 F.2d 618, 620, 195 USPQ 6, 8 (CCPA 1977); emphasis original.

5) Page 9, lines 3 to 5, of the Office action.

raised by at least 1°C from one temperature zone to the next as an indication that increasing the temperature from zone to zone is inessential: Under those circumstances the person of ordinary skill would expect to arrive at the same or a similar result as was illustrated in *Braune's* examples. If it is expected that the temperature regimen in the (trans)esterification stage (a) of *Braune's* process is of no consequence, then it is also expected the products which are obtained when those temperatures are modified are essentially the same. This is, however, not the case as shown by applicants' data<sup>6</sup>). Accordingly, even under the assumption made by the Examiner, the teaching of *Braune* fails to render applicants' invention as a whole obvious. Favorable reconsideration of the Examiner's position and withdrawal of the rejection under Section 103(a) is therefore deemed equitable.

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Respectfully submitted,

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Encl.: THE LISTING OF CLAIMS (Appendix I)  
THE CURRENT CLAIMS (Appendix II)

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6) Note applicants comments on the showing provided in the application in their previous reply, pages 4 and 5.

## A P P E N D I X I:

THE LISTING OF CLAIMS (version with markings):

1. (previously submitted) A process for the continuous preparation of polybutylene terephthalate from terephthalic acid and 1,4-butanediol, comprising:
  - a) direct esterification of terephthalic acid with 1,4-butanediol in a reactor cascade comprising at least two reactors,
  - b) precondensation of the esterification product obtained in stage a), and
  - c) polycondensation of the precondensate obtained in stage b),wherein the reaction pressure decreases and the temperature does not increase along the reactor cascade in stage a).
2. (original) A process as claimed in claim 1, wherein the esterification in stage a) is carried out at pressures of < 1 bar.
3. (previously submitted) A process as claimed in claim 1, wherein, in a reactor cascade comprising three reactors, the pressure in the first reactor (p1) is < 1 bar, the pressure in the second reactor (p2) is < p1 - 100 mbar and the pressure in the third reactor (p3) is < p2.
4. (previously submitted) A process as claimed in claim 1, wherein the esterification stage a) is carried out at from 170 to 250°C.
5. (previously submitted) A process as claimed in claim 1, wherein the molar ratio of 1,4-butanediol to terephthalic acid at the beginning of stage a) is from 1.1:1 to 3.5:1.
6. (previously submitted) A process as claimed in claim 1, wherein the conversion after the last reactor of stage a) is > 97%, based on terephthalic acid, before the precondensation in stage b) commences.
7. (currently amended) A process as claimed in claim 1, wherein the direct esterification stage a) is carried out in the presence of tetrabutyl orthotitanate as a catalyst.
8. (previously submitted) A process as claimed in claim 1, wherein the precondensation stage b) is carried out at temperatures from 220 to 300°C and pressures in the range from 0.05 bar to the esteri-

fication pressure in the last reactor of the reactor cascade of stage a).

9. (*previously submitted*) A process as claimed in claim 1, wherein the precondensate obtained in stage b) is polycondensed in stage c) at from 240 to 290°C and pressures of from 0.2 to 20 mbar.
10. (*original*) A process as claimed in claim 9, wherein the polycondensation is continued until the polycondensate obtained has an acid number of < 50 meq/kg.
11. (*canceled*)

## A P P E N D I X II:

THE CURRENT CLAIMS (clean version):

1. (previously submitted) A process for the continuous preparation of polybutylene terephthalate from terephthalic acid and 1,4-butanediol, comprising:
  - a) direct esterification of terephthalic acid with 1,4-butanediol in a reactor cascade comprising at least two reactors,
  - b) precondensation of the esterification product obtained in stage a), and
  - c) polycondensation of the precondensate obtained in stage b),wherein the reaction pressure decreases and the temperature does not increase along the reactor cascade in stage a).
2. (original) A process as claimed in claim 1, wherein the esterification in stage a) is carried out at pressures of < 1 bar.
3. (previously submitted) A process as claimed in claim 1, wherein, in a reactor cascade comprising three reactors, the pressure in the first reactor (p1) is < 1 bar, the pressure in the second reactor (p2) is < p1 - 100 mbar and the pressure in the third reactor (p3) is < p2.
4. (previously submitted) A process as claimed in claim 1, wherein the esterification stage a) is carried out at from 170 to 250°C.
5. (previously submitted) A process as claimed in claim 1, wherein the molar ratio of 1,4-butanediol to terephthalic acid at the beginning of stage a) is from 1.1:1 to 3.5:1.
6. (previously submitted) A process as claimed in claim 1, wherein the conversion after the last reactor of stage a) is > 97%, based on terephthalic acid, before the precondensation in stage b) commences.
7. (currently amended) A process as claimed in claim 1, wherein the direct esterification stage a) is carried out in the presence of tetrabutyl orthotitanate as a catalyst.
8. (previously submitted) A process as claimed in claim 1, wherein the precondensation stage b) is carried out at temperatures from 220 to 300°C and pressures in the range from 0.05 bar to the esterification pressure.

fication pressure in the last reactor of the reactor cascade of stage a).

9. (*previously submitted*) A process as claimed in claim 1, wherein the precondensate obtained in stage b) is polycondensed in stage c) at from 240 to 290°C and pressures of from 0.2 to 20 mbar.
10. (*original*) A process as claimed in claim 9, wherein the polycondensation is continued until the polycondensate obtained has an acid number of < 50 meq/kg.
11. (*canceled*)